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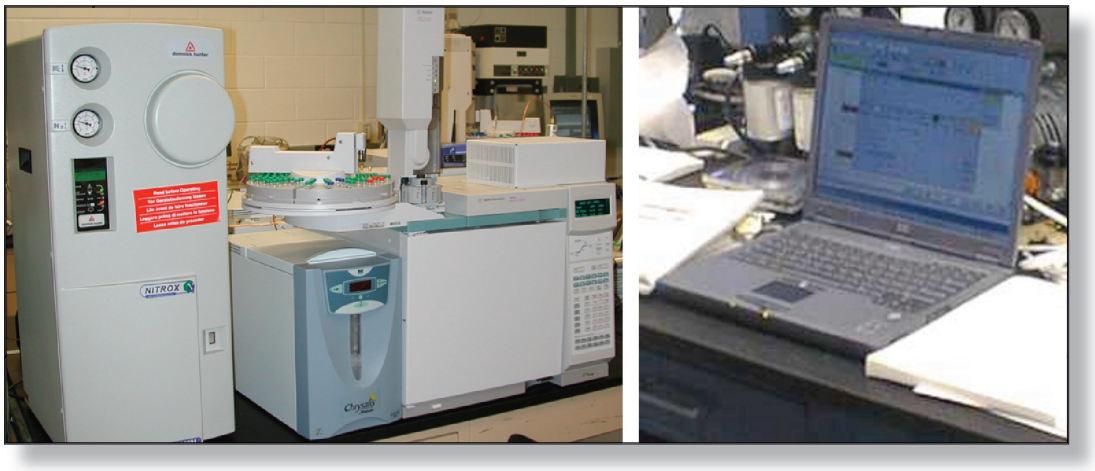
Science and Technology for Tomorrow's Air and Space Force

Success Story

ULTRA-FAST ANALYZER ENSURES SAFE USE OF JET FUELS



The Propulsion Directorate, in partnership with the University of Dayton Research Institute (UDRI), developed a rapid investigative tool using commercial off-the-shelf equipment that can characterize key fuel properties in less than 5 minutes. The equipment was developed to support the Air Force Petroleum Office deployed laboratories.

The ultra-fast gas chromatographic method determines the fuel's "fingerprint" and uses the information to predict distillation range, freeze point, flash point, and sulfur content. The fingerprint also helps to identify potential fuel contamination.

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Accomplishment

Directorate chemical research engineers in the Fuels Branch and UDRI created a fast gas chromatograph (GC) that runs a fuel recognition process in only 5 minutes versus a standard GC, which takes about 1–2 hours. The new GC quickly detects off-spec fuel and identifies fuels differently than they were originally labeled.

The directorate developed the equipment to reduce the transportation footprint and time required to run four different tests using four separate instruments. The unit is also field-deployable and relatively inexpensive, at an estimated $35,000 for each instrument. The instrument gives warfighters rapid distillate fuel recognition of Jet Propellant (JP)-8, JP-7, Jet A, Jet Propellant Thermally Stable, diesel, and aviation gas along with composition-property relationships for flash point, distillation range, freeze point, sulfur content, heat combustion, and others.

Background

The fast GC is an instrument that examines different fuel types by separating the complex petroleum mixtures and determines whether or not they are safe for military use. The GC creates a very accurate "fingerprint" depiction of each fuel type. Samples of fuels are placed in a computer-controlled auto sampler that grabs the bottle containing the fuel and places it under a syringe that extracts the fuel. The fuel in the syringe is then injected into a glass tube, the inside of which is slightly larger than a human hair. The smaller the dimensions of the tube, the faster the analysis will be. Inside the tube, the fuel separates into its volatile and non-volatile components; avolatile substance is one prone to evaporation. The most volatile components come out of the process first and the least volatile ones last. From this process, a gas chromatogram is formed. The chromatogram can then be related to various properties of fuel.

Propulsion
Support to the Warfighter

Additional information

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